

WE CLAIM:

- 1 1. A method of making a thin film transistor (TFT)
2 array comprising the steps of:
3 a) providing a first substrate;
4 b) forming a plurality of TFT gate electrodes
5 connected to gate lines on the substrate;
6 c) forming a gate insulating layer over the
7 gate electrodes;
8 d) forming and patterning a semiconductor
9 layer over each of the gate electrodes in TFT areas;
10 e) forming TFT source and drain electrodes in
11 each TFT area with a TFT channel therebetween and a
12 plurality of corresponding drain lines, thereby forming
13 an array of TFTs on the first substrate;
14 f) depositing a photo-imageable insulating
15 layer over a substantial portion of the substrate so as
16 to cover substantial portions of the gate and drain lines
17 and the TFTs in the array;
18 g) photo-imaging the insulating layer so as to
19 form a plurality of vias or contact holes therein, at
20 least one via corresponding to each TFT in the array;
21 h) forming a plurality of pixel electrodes
22 over the insulating layer so that each pixel electrode is
23 in communication with the source electrode of a
24 corresponding TFT through one of the vias; and

26 i) forming the pixel electrodes on the
27 substrate so that each pixel electrode overlaps one of
28 the drain and gate lines whereby the pixel electrodes are
29 insulated from the lines in the overlap areas by the
30 photo-imaged insulating layer.

1 2. The method of claim 1, further including the
2 steps of:
3 depositing the insulating layer in step f) as a
4 negative resist;
5 irradiating the negative resist insulating
6 layer with ultraviolet (UV) rays in step g); and
7 developing the irradiated negative resist
8 insulating layer in step g) so as to remove areas which
9 were not exposed to the UV rays thereby forming the vias.

1 3. The method of claim 2, further including the
2 step of depositing the insulating layer in step f) so as
3 to include photo-imageable benzocyclobutene (BCB) which
4 is an organic material, thereby reducing capacitive
5 cross-talk between the pixel electrodes and the lines in
6 the overlap areas.

1 4. The method of claim 1, further comprising the
2 step of depositing the insulating layer in step f) so
3 that the insulating layer has a dielectric constant less
4 than about 5.0.

1 5. The method of claim 4, further comprising the
2 step of depositing the insulating layer in step f) so
3 that the insulating layer has a dielectric constant less
4 than about 3.0.

1 6. The method of claim 1, further comprising in
2 step f) depositing the insulating layer including 2-
3 Ethoxyethyl acetate.

1 7. The method of claim 1, wherein the insulating
2 layer includes an organic mixture of 2-Ethoxyethyl
3 acetate, methacrylate derivative copolymer, and
4 polyfunctional acrylate.

1 8. A method of making a liquid crystal display
2 including an array of semiconductor switching elements,
3 the method comprising the steps of:
4 a) providing a first substrate;
5 b) forming an array of semiconductor based
6 switching elements and corresponding address lines on the
7 first substrate;
8 c) spin coating an organic photo-imageable
9 insulating layer onto the first substrate over the
10 switching elements and address lines;
11 d) photo-imaging the insulating layer in order
12 to form a first group of vias or contact holes therein,

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13 each via in the first group corresponding to one of the
14 switching elements; and

15 e) forming an array of pixel electrodes over
16 the photo-imaged insulating layer so that each pixel
17 electrode communicates with one of the switching elements
18 through one of the vias in the insulating layer.

1 9. The method of claim 8, further comprising the
2 step of photo-imaging in step d) the insulating layer to
3 form a second group of vias or contact holes, each via in
4 the second group corresponding to a storage capacitor of
5 a pixel.

1 10. The method of claim 9, further comprising the
2 steps of:
3 providing a second substrate, and sandwiching a
4 liquid crystal layer between the first and second
5 substrates so as to form the liquid crystal display.

1 11. The method of claim 8, further comprising the
2 steps of:

3 in step d) irradiating or exposing the
4 insulating layer with UV rays; and

5 following said irradiating, developing the
6 photo-imaged insulating layer so as to remove non-exposed
7 areas of the insulating layer so as to form the vias.

1 12. The method of claim 11, further including the
2 step of curing the insulating layer after said developing
3 step.

1 13. The method of claim 8, wherein the insulating
2 layer formed in step c) includes one of: (i) BCB; and
3 (ii) an organic mixture including 2-Ethoxyethyl acetate.

1 14. The method of claim 8, wherein said steps are
2 performed in the order they are recited.

1 15. A method of making an array of semiconductor
2 based thin film transistors (TFTs), the method comprising
3 the steps of:

4 providing a first substantially transparent
5 substrate;

6 forming an array of TFTs and corresponding
7 address lines on the first substrate;

8 depositing an organic photo-imageable
9 insulating layer over both the TFT array and
10 corresponding address lines;

11 photo-imaging the insulating layer in order to
12 form a first array of vias or contact holes therein; and

13 forming an array of electrode members on the
14 first substrate over the photo-imaged insulating layer so
15 that the electrode members in the array are in

16 communication with the corresponding TFTs through the
17 first array of vias or contact holes.

1 16. The method of claim 15, further comprising the
2 step of overlapping the address lines with the electrode
3 members so that the photo-imaged insulating layer is
4 disposed therebetween so as to reduce cross-talk.

1 17. The method of claim 16, further comprising the
2 steps of (i) using the TFT array in one of a liquid
3 crystal display and an image sensor, and (ii) forming the
4 insulating layer so as to include one of photo-imageable
5 BCB and 2-Ethoxyethyl acetate.

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